APPENDIX A: Development of an Ecological Integrity Scorecard

We can illustrate some of the features needed to go from vital sign selection to ecological integrity ranks and scorecards through the following sequence. First, a series of steps are taken to draft a list of potential vital signs and measures for the network and parks. These include the development of conceptual models and potential vital signs in Phase I, and a selection process for the high priority vital signs and measures in Phase II. The Vital Signs and measures can then be linked to specific ecosystem targets known to be in each park. In this way, assessments of trends in the VS and measures are tailored to the systems that they will be measuring.

In Phase III, the protocols for each measure are developed, including guidance on how frequently to remeasure a set of Vital Signs. By compiling information from baseline studies in the park, reference sites outside the park, and understanding the historic range of variability of vital signs and measures for each system, it may be possible to improve our understanding of how best to measure the vital signs. The same information can help develop a rating scale for each measure, whereby values are placed on a scale from Very Good to Poor (Figure 1). The reasoning behind the rating scale is that properly chosen measures should help inform managers' understanding of changes to ecological integrity. Changes in the values of the measures can be interpreted as

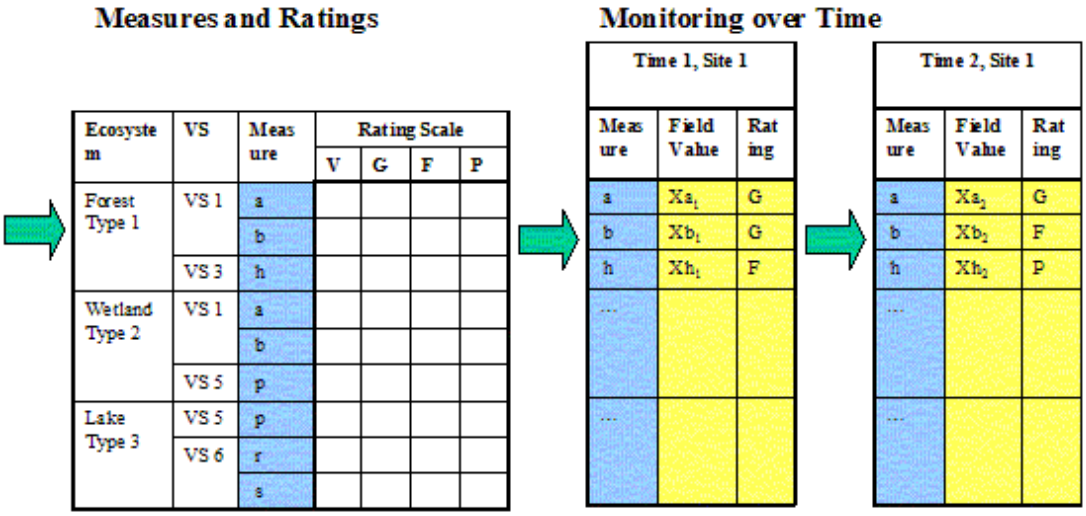

Figure 1. Illustration of the steps that could be taken in Phase III to establish ratings for the vital signs and measures. Ratings = V = Very Good, G = Good, F = Fair, P = Poor. For example, Measure a = exotic species percent cover, where A= < 1 % cover exotic species, B = 1-4 % cover, C = 5-20%, D = >20%. Ratings can also be ecosystem specific. E.g., percent exotic species cover may have different thresholds in a wetland ecosystem as compared to a terrestrial forest ecosystem, even though the method for collecting the field values may be identical across these systems.

improving or degrading ecological integrity. Note, however, that field values are still recorded and stored independently of the ratings, allowing for ongoing refinement of the rating scale.

Once measures and ratings are in place, it may be possible to aggregate the measures within a system, and perhaps across systems, to communicate trends into a kind of ecological integrity scorecard, (Karr and Chu 1995, Young and Sanzone 2002, EPA 2002a, NatureServe 2002, Parrish et al. 2003).

One example of such an approach is provided by NatureServe and the Natural Heritage Network, which has established and maintained an approach for documenting the integrity and viability of individual locations or occurrences of biodiversity elements, including species, ecological communities, and systems. Historically, this methodology has been based on a more qualitative, or expert-driven protocol (see Stein et al. 2000, Brown et al. 2004). This basic approach is now being advanced through the identification and use of key ecological attributes (= to vital signs) and quantitative indicators (measures) (Parrish et al. 2003, Brown et al. 2004). One or more indicators (measures) of each key ecological attribute (vital sign) are chosen and measured in the field. Thresholds among a range of indicator ratings describe the relative conditions of a given occurrence. Standard procedures can then be used to integrate the ratings for each indicator into overall scores for the relative ecological integrity of occurrences, from "poor – D" to "excellent – A." (Figure 2). The basic methodology is well established (NatureServe 2002, Brown et al. 2004), and is in wide use across the NatureServe network. Integrating this kind of approach into the Vital Signs program not only provides an effective communication tool but also aids in setting clear monitoring objectives and management thresholds, such as ensuring that no occurences fall below a B rank (Figure 2). It also provides the opportunity to compare the condition of park ecosystems with those in the surrounding region, thereby providing a regional perspective on park ecosystem condition that may further assist in management and monitoring prioritization.

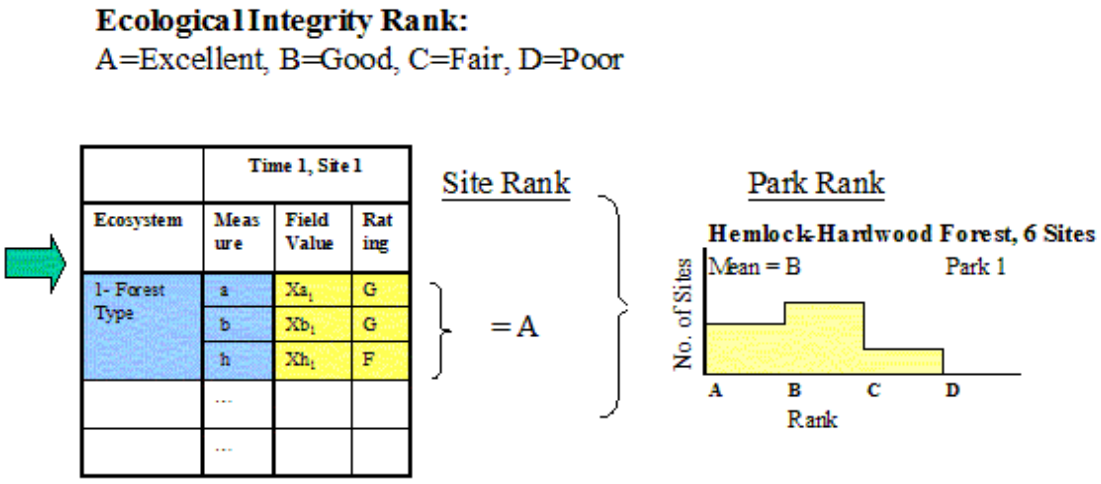

Figure 2. Illustration of how a Vital Signs program can be integrated into an Ecological Integrity Scorecard approach. Ratings are developed for individual measures, and field values can be assigned the rating score. These scores are then combined into an overall ecological integrity rank for the Ecosystem at a given site. All sites within a park for a given ecosystem type could also be rolled up into a park rank or displayed as a histogram. Note: Because field values for individual vital signs and measures are stored, they can always be assessed independently of the scorecard approach.